BIOLOGY AND HABITS OF *HIPPOPSIS LEMNISCATA* (COLEOPTERA: CERAMBYCIDAE)[1,2]

GARY L. PIPER

Department of Entomology, Texas A&M University,
College Station, TX 77843

ABSTRACT

Information on the life cycle of *Hippopsis lemniscata* (Fabricius), a cerambycid attacking common ragweed, *Ambrosia artemisiifolia* L., is presented. The beetle is univoltine in northeastern Ohio, with peak adult emergence occurring during a 3-4 wk period from early July to early August. Eggs are deposited singly within the pith of the stem. First- to fourth-stage larvae bore into and feed upon the pith. Mature larvae overwinter in a state of temperature-induced quiescence within the stem. Pupation occurs within the stem in a specially constructed pupal chamber. Despite extensive feeding, pith destruction by larval *H. lemniscata* does not appear to affect the competitive or reproductive capacities of *A. artemisiifolia.*

INTRODUCTION

The ragweeds (*Ambrosia* spp.: Compositae) are serious agricultural weeds and medically important, aeroallergenic pollen-producers responsible for late-summer and fall hayfever throughout much of North America. Surveys of the phytophagous insect faunas of selected ragweed species have revealed the existence of a diverse assemblage of insects, many of which are poorly known biologically (Harris and Piper 1970, Goeden and Ricker 1974a, b, 1975, 1976a). The paucity of detailed biological and ecological information on *Ambrosia* insects has prompted several recent investigations (Gilstrap and Goeden 1974, Goeden and Ricker 1976b and Piper 1975, 1976, 1977).

Common ragweed, *A. artemisiifolia* L., is attacked by a variety of phytophagous Coleoptera in northeastern Ohio (Piper 1970). One such associate is the cerambycid, *Hippopsis lemniscata* (Fabricius). Since very little was known about this beetle, a study of its biology and habits was initiated.

The genus *Hippopsis* Serville (Cerambycidae: Lamiinae) contains but 1 Nearctic and Neotropical species, *H. lemniscata.* In North America the beetle is restricted to the eastern United States, and in South America to Brazil (Leng and Hamilton 1896).

Craighead (1923) and Hack (1935) presented life history notes on *H. lemniscata.* Larval, pupal, and adult descriptions and/or illustrations were provided by Craighead (1923), Knull (1946), and Peterson (1951). Larval feeding is not restricted entirely to *Ambrosia* spp. Additional host plants reported in the literature include *Melothria pendula* L. and *Bidens* sp. (Leng and Hamilton 1896), *Coreopsis* sp. (Blatchley 1910), *Erigeron ramo-*

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sus (Walt.) (Craighead 1923), and *Vernonia interior* Small (=*baldwinii* Torrey) (Schwitzgebel and Wilbur 1942).

Biological observations on *H. lemniscata* are based on rearings initiated by adults, larvae, and pupae collected in or near the city of Kent (Portage County) in northeastern Ohio. Laboratory rearings were carried out at room temperatures of 20°-25°C, 50%-60% RH, and a 12/12 hr photoperiod.

Life History

Hippopsis lemniscata has been recorded from Michigan (Gosling and Gosling 1976), east to New York, south to Florida and west to Texas (Leng and Hamilton 1896). Adults are slender, 10-13 mm long and dark reddish brown, with 4 yellowish brown longitudinal stripes on the head and pronotum and 3 stripes on each elytron.

Although a few adults were collected in late June, the beetles were most abundant in July and early August, gradually decreasing in number as summer progressed. Adults reared from pupae lived from 1-3 mo, the females living slightly longer than males. There was 1 generation annually in northeastern Ohio. The seasonal distribution of the various life stages is shown in Fig. 1.

The adults generally remained closely associated with *A. artemisiifolia* and only rarely were observed on other vegetation. During the hottest time of the day, the beetles were relatively inactive, resting on the lower shaded portions of ragweed stems. Although adults are strong fliers, they were reluctant to fly and either fell to the soil beneath the plant when disturbed or remained on the stem and stridulated in a manner like that described by Linsley (1961). Both sexes fed extensively upon the epidermis and underlying stem tissue. However, the feeding activity did not result in any detectable plant damage.

The premating period was not determined. Mating was observed most frequently in nature during the morning or evening hours on the lowermost portion of the host plant. No overt precopulatory behavior was exhibited by the male. The male mounted the female from behind by moving directly forward and onto her dorsum. His front tarsi clasped her humeri and the middle tarsi grasped either her hind coxae or abdomen caudad of the hind legs. The male's hind legs touched the plant surface. Both male and female antennae were directed forward, those of the female being positioned between the male's slightly divergent antennae. Having attained the proper position (Fig. 2), the male's abdomen was directed ventrocephalad and coupling was achieved with the extruded female genitalia. While in copula, the male occasionally appressed his mandibles and/or maxillary palpi to the female's pronotum, scutellum, or basal elytral margin. The female generally remained quite passive during copulation which lasted anywhere from 15-60 min. Repeated matings between the same male and female occurred frequently in the laboratory, both before and after oviposition had commenced. A male was capable of mating with different females and a female accepted different males.

The preoviposition period (from emergence to 1st deposition of eggs) of 7 females averaged 14.5 days. These females each laid an average of 1 egg/day (range 0-10) over a 43 (range 32-53) day period. Total eggs produced/female ranged from 20-60, the average being 42.

Oviposition was observed at various times during the day, but occurred more commonly during the late afternoon and evening hours. The female usually selected a suitable oviposition site on the uppermost third of a stem. She positioned her body parallel to the stem with the head directed downward (Fig. 3) and then proceeded to gnaw a funnel-shaped hole ca. 1.0-1.3 mm in diameter through the stem epidermis and cortex (Fig. 4). Immediately after completing the egg niche, the female reversed her position on the stem so that the head now pointed upward. She bent the abdomen downward, extended the ovipositor slightly, and probed for the hole. Upon locating the aperture, the female inserted the ovipositor and deposited a single egg in the pith. The egg was positioned parallel to the stem's upright axis. Eggs were found in the field from mid-July to mid-September. The incubation period of 20 eggs held under laboratory conditions averaged 6 (range 5-7) days.

The first-stage larva of *Hippopsis* is equipped with thoraco-abdominal hatching spines (Gardiner 1966). The chorion was ruptured as a result of peristaltic movement by the larva. Extrication of the abdominal segments occurred prior to removal of the head from the chorionic remnant.

The neonate larva tunnelled the pith located in the apical portion of the stem. The increased girth of the late second- and third-stage larva, coupled with increased stem narrowness, prohibited further upward movement and feeding. When this occurred, a larva reversed its direction and fed toward the base of the plant. The third- and fourth-stage larva fed on the pith until it was consumed completely from the apex to ground level.

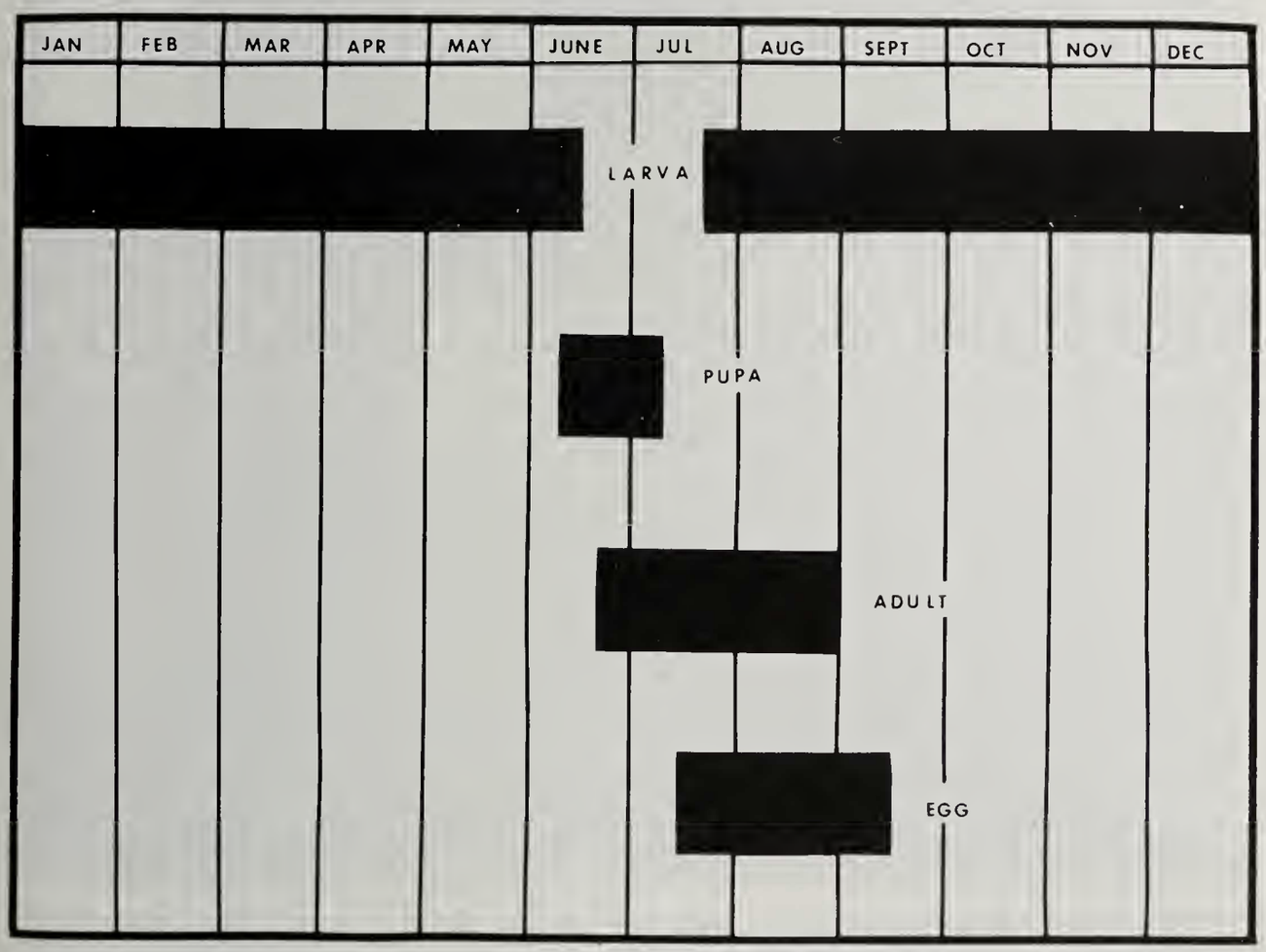


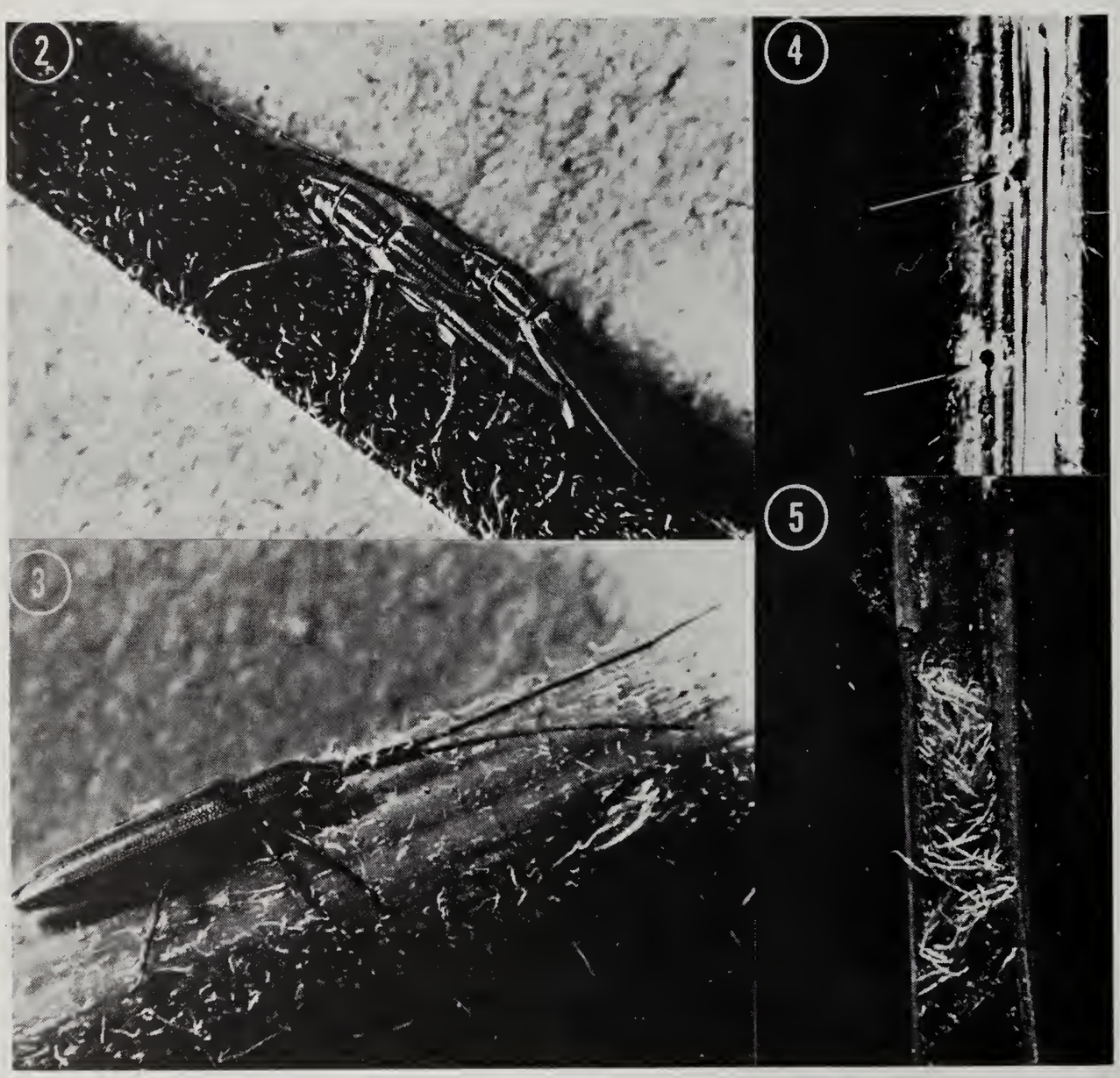
Fig. 1. Seasonal history of *Hippopsis lemniscata* on *Ambrosia artemisiifolia* in Ohio.

The length of the larval gallery ranged from 30-61 cm, the length being governed by plant height. Even though feeding was extensive, pith destruction did not appear to affect the competitive or reproductive capacities of *A. artemisiifolia*. The first larval stadium was completed in 7-11 days, the second in 6-10 days, the third in 6-10 days, and the fourth, under laboratory conditions only, in 10-17 days.

Field observations indicated that there was only 1 larva/stem, even though several eggs may have been deposited/stem.

H. lemniscata larvae exhibited cannibalistic tendencies in the laboratory. This behavioral characteristic undoubtedly explains why only a single larva reaches maturity in nature.

In late October and November with the onset of cool temperatures, the fourth-stage larva prepared a pupal chamber within the hollowed-out ragweed stem. The chamber, situated in the basal third of the stem, consisted of a section of the linear larval gallery partitioned off with an upper and



Figs. 2-5. *Hippopsis lemniscata*: 2) Mating posture of adults; 3) Female gnawing an oviposition hole; 4) Section of stem showing a partially excavated hole (top) and a completed hole (bottom); 5) Pupal chamber frass and fecula plug.

a lower 2-3 cm long plug of fecula and excelsior-like frass (Fig. 5). The larva overwintered in a state of temperature-induced quiescence within the chamber.

Pupation occurred during June and early July. In nature, a larva always pupated head upward within the chamber. The pupa was very active and capable of rapidly ascending and descending its chamber. Duffey (1953) suggested that this behavior may allow the pupa to avoid unfavorable conditions such as waterlogged stems, fungal growth, predators, and parasites. No predation on or parasitism of any life stage was recorded in the field during the study but this does not preclude the possibility of its existence.

The duration of the pupal period averaged 11 (range 9-14) days. Sequential body coloration changes were observed throughout the pupal period. The eyes were the first structures to become pigmented, followed by the mandibles, tarsal claws, antennae, elytra, and head. The teneral adult was fully pigmented and sclerotized within 24-36 hr. The adult gnawed a subcircular to circular hole through the wall of the stem and escaped.

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